

Exercise 3: Propositional Logic Proving

There are four PVS files available with various formulas to prove so you can gain some practice using the theorem prover. The files are available in your directory.

1. The first file is named `prop_basic.pvs`. It contains a set of elementary propositional logic formulas expressed in PVS. Examine the formulas in the file. Typecheck the file, then use the PVS prover to attempt a selection of these lemmas. Use only `split` and `flatten` commands. Experiment with `undo` to backtrack within a proof tree and `postpone` to move to a different branch. Also experiment with the graphical proof display provided by `M-x x-show-current-proof`.
2. The second file is named `landing_weather.pvs`. It, too, contains a set of propositional PVS formulas expressed as lemmas. Prove these lemmas using only `split`, `flatten`, `lemma` and `expand` commands. The lemmas are arranged in an order that allows you to use earlier ones in the proofs of later ones.
3. The last file is named `FLT_lite_prop.pvs`. It lists several lemmas and one theorem. An accompanying file, `FLT_lite.pvs`, contains background definitions needed by these formulas. In this example, a high-level sketch of the proof of Fermat's Last Theorem is provided.

Examine the files `FLT_lite.pvs` and `FLT_lite_prop.pvs`. Decide how you might establish the main FLT theorem at the end of theory `FLT_lite_prop`. It is called `FLT_extra_light`. Prove this theorem using only `split`, `flatten` and `lemma` commands. Invoke the supporting lemmas as needed in your proof. Do not try to prove any of these lemmas (you will not be able to do so).